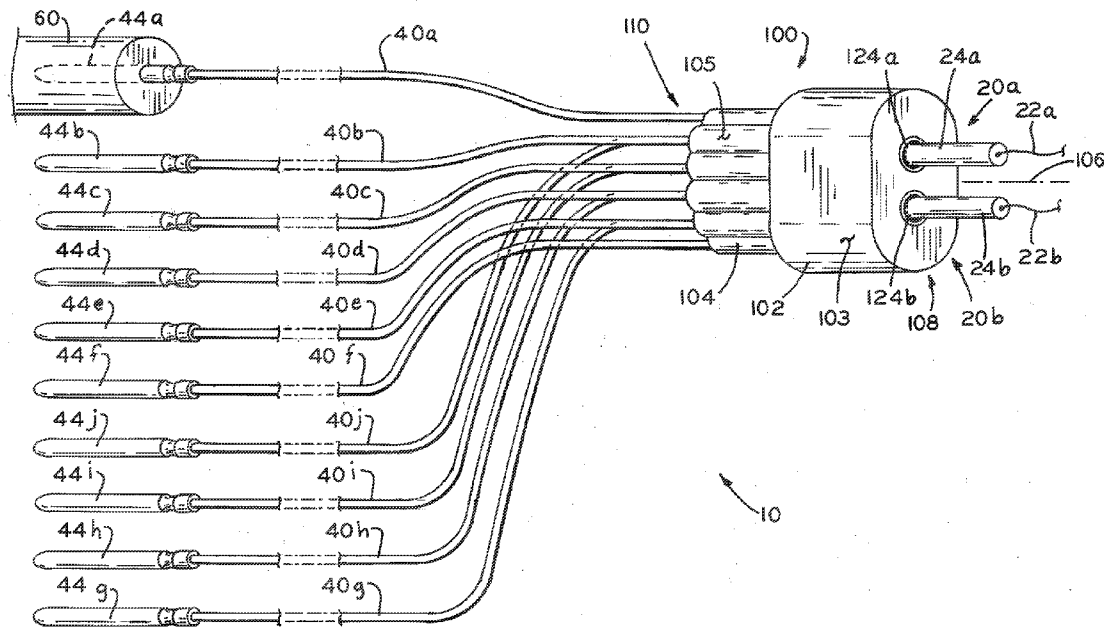


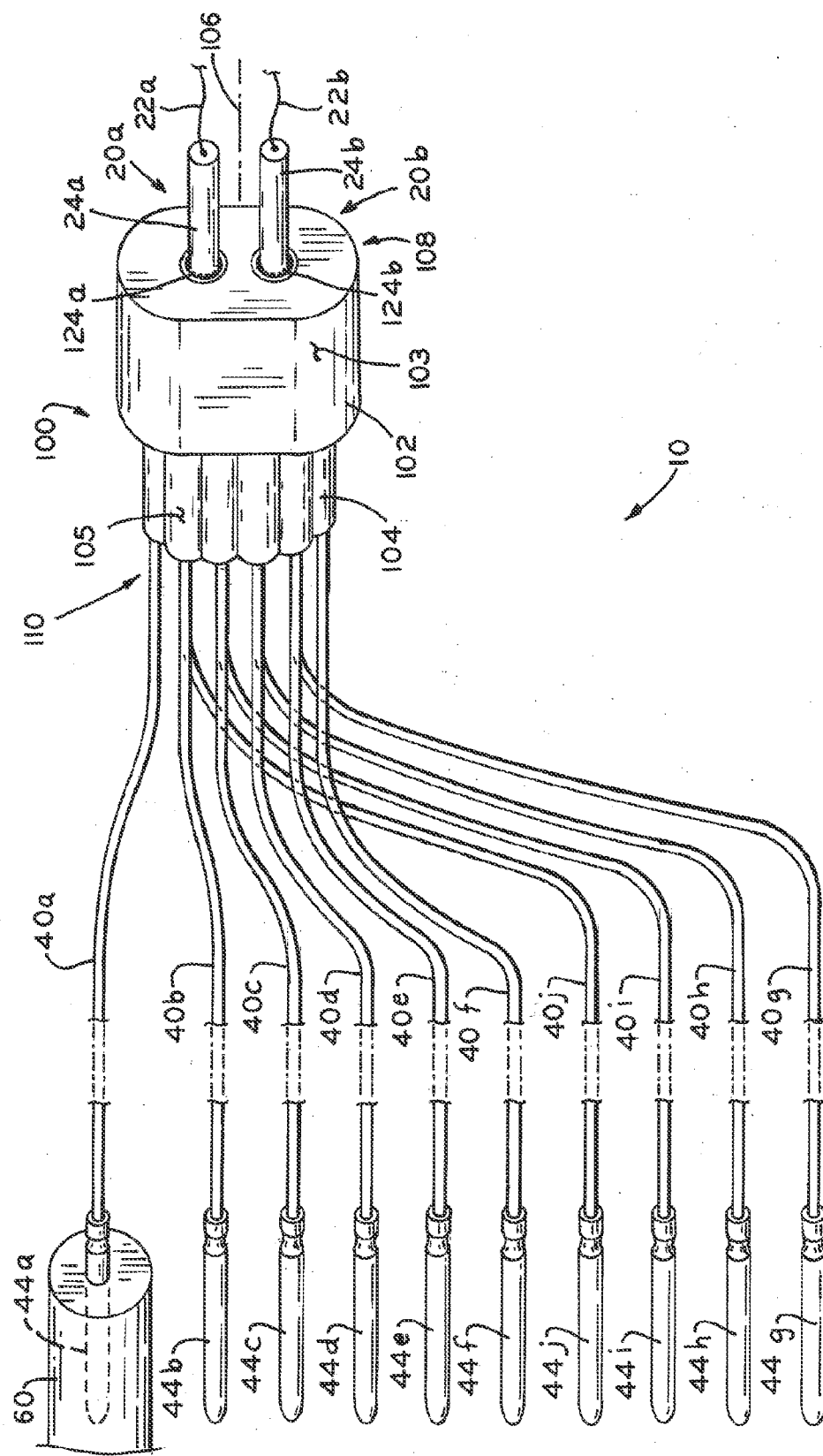


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(19) **United States**(12) **Patent Application Publication**
Scheid et al.(10) **Pub. No.: US 2014/0060368 A1**(43) **Pub. Date: Mar. 6, 2014**(54) **SIMULTANEOUS NONELECTRIC PRIMING
ASSEMBLY AND METHOD****Publication Classification**(71) Applicants: **Eric Scheid**, Bloomington, IN (US);
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Thomas Gailey, Spring Lake, NC (US)(51) **Int. Cl.**
C06C 5/06 (2006.01)
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(52) **U.S. Cl.**
CPC .. **C06C 5/06** (2013.01); **F42D 1/043** (2013.01)
USPC **102/275.7**(72) Inventors: **Eric Scheid**, Bloomington, IN (US);
Brad Moan, Greenwood, IN (US);
Thomas Gailey, Spring Lake, NC (US)(21) Appl. No.: **13/790,602**(22) Filed: **Mar. 8, 2013****Related U.S. Application Data**(62) Division of application No. 12/982,658, filed on Dec.
30, 2010, now Pat. No. 8,402,892.(57) **ABSTRACT**

A priming assembly and a method are provided for coupling a plurality of detonators to at least one explosive through a plurality of transmission lines. The priming assembly may include a housing that receives the plurality of detonators and the plurality of transmission lines. In use, the plurality of transmission lines may communicate with the plurality of detonators within the housing to transmit explosive charges from the plurality of detonators to the at least one explosive.





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FIG. 4

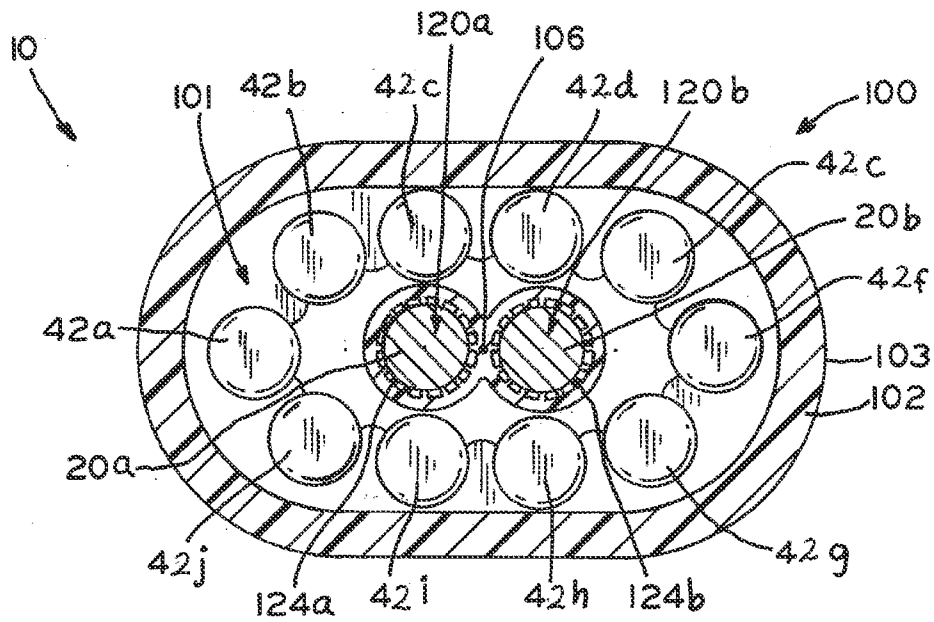


FIG. 5

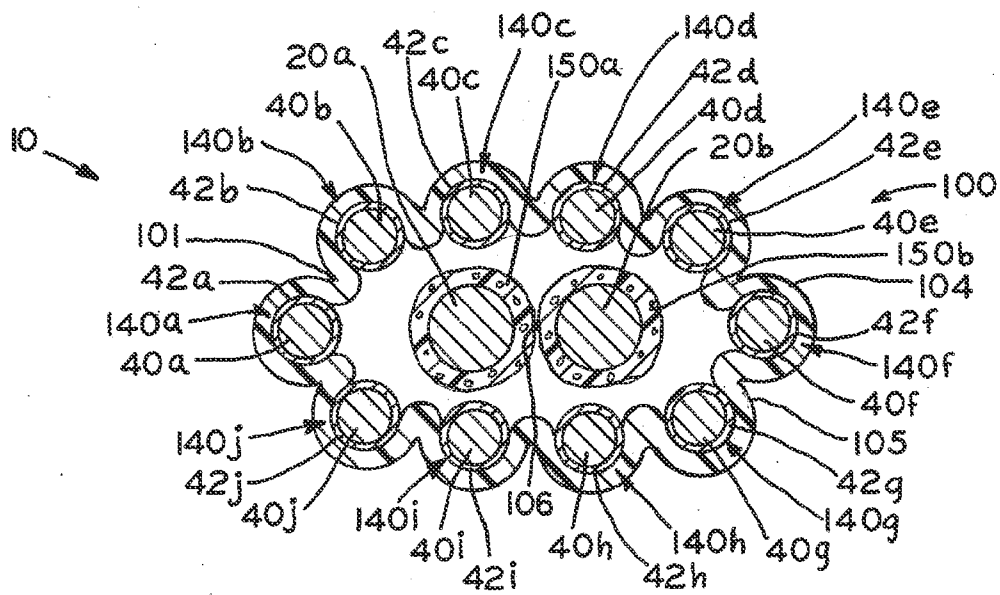


FIG. 6

SIMULTANEOUS NONELECTRIC PRIMING ASSEMBLY AND METHOD

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0001] The invention described herein includes contributions by one or more employees of the Department of the Navy made in performance of official duties and may be manufactured, used and licensed by or for the United States Government for any governmental purpose without payment of any royalties thereon.

BACKGROUND AND SUMMARY OF THE DISCLOSURE

[0002] The present disclosure relates to a priming assembly and a method for coupling a plurality of detonators to at least one explosive through a plurality of transmission lines.

[0003] To perform certain mining operations, excavation operations, drilling operations, demolition operations, and military operations, for example, an explosive may be placed at a blasting site. To ensure the safety of a user, the user may trigger and detonate the explosive from a location remote from the blasting site.

[0004] According to an illustrative embodiment of the present disclosure, a priming assembly is provided for coupling a plurality of detonators to at least one explosive through a plurality of transmission lines. The priming assembly includes a housing having an outer wall, the housing extending along a longitudinal axis from a first end to a second end. The housing defines a plurality of detonator receptacles that are configured to receive the plurality of detonators and a plurality of transmission line receptacles that are configured to receive the plurality of transmission lines, each of the plurality of transmission line receptacles being semi-circular in shape to retain the plurality of transmission lines and to position the plurality of transmission lines relative to the plurality of detonators in the plurality of detonator receptacles while exposing the plurality of transmission lines to the plurality of detonators in the plurality of detonator receptacles such that an explosive charge from at least one of the plurality of detonators is communicated to the plurality of transmission lines and to the at least one explosive.

[0005] According to another illustrative embodiment of the present disclosure, a priming assembly is provided that includes a plurality of detonators, at least one of the plurality of detonators being configured to generate an explosive charge, a plurality of transmission lines, at least one explosive, and a housing having a plurality of detonator receptacles that are sized to receive the plurality of detonators and a plurality of transmission line receptacles that are sized to receive the plurality of transmission lines, each of the plurality of transmission line receptacles being semi-circular in shape to retain the plurality of transmission lines and to position the plurality of transmission lines relative to the plurality of detonators in the plurality of detonator receptacles while exposing the plurality of transmission lines to the plurality of detonators in the plurality of detonator receptacles such that the explosive charge from the at least one detonator is communicated to the plurality of transmission lines and to the at least one explosive.

[0006] According to yet another illustrative embodiment of the present disclosure, a method is provided for coupling a first detonator and a second detonator to at least one explo-

sive. The method includes the steps of: providing a housing that includes a first detonator receptacle, a second detonator receptacle, and a plurality of transmission line receptacles, the plurality of transmission line receptacles receiving a plurality of transmission lines; inserting the first detonator into the first detonator receptacle of the housing to communicate with the plurality of transmission lines; inserting the second detonator into the second detonator receptacle of the housing to communicate with the plurality of transmission lines; and coupling the plurality of transmission lines to the at least one explosive.

[0007] According to still yet another illustrative embodiment of the present disclosure, a method is provided for manufacturing a priming assembly for coupling a plurality of detonators to at least one explosive through a plurality of transmission lines. The method includes the steps of: forming a housing that includes an outer wall defining an interior of the housing, a plurality of detonator receptacles in the interior of the housing, and a plurality of transmission line receptacles in the interior of the housing, the plurality of detonator receptacles being sized to receive the plurality of detonators and the plurality of transmission line receptacles being sized to receive the plurality of transmission lines, at least one of the plurality of transmission line receptacles communicating with the plurality of detonator receptacles within the housing; and inserting the plurality of transmission lines into the plurality of transmission line receptacles in the housing, at least one of the plurality of transmission lines communicating with the plurality of detonator receptacles within the housing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The above-mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention itself will be better understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings, wherein:

[0009] FIG. 1 is a front, assembled perspective view of an illustrative embodiment priming assembly that includes a housing for coupling a plurality of detonators to at least one explosive through a plurality of transmission lines;

[0010] FIG. 2 is a front, exploded perspective view of the priming assembly of FIG. 1, also showing a booster material that is located within the housing;

[0011] FIG. 3 is a rear, exploded perspective view of the housing of FIG. 3;

[0012] FIG. 4 is a cross-sectional view of the priming assembly of FIG. 1;

[0013] FIG. 5 is a cross-sectional view of the priming assembly of FIG. 4, taken along line 5-5 of FIG. 4; and

[0014] FIG. 6 is another cross-sectional view of the priming assembly of FIG. 4, taken along line 6-6 of FIG. 4.

[0015] Corresponding reference characters indicate corresponding parts throughout the several views. The exemplifications set out herein illustrate exemplary embodiments of the invention and such exemplifications are not to be construed as limiting the scope of the invention in any manner.

DETAILED DESCRIPTION OF THE DRAWINGS

[0016] Referring to FIG. 1, a priming assembly 10 is provided that includes a housing 100 for coupling a plurality of detonators 20 to at least one explosive 60 through a plurality of nonelectric transmission lines 40. Although only a single

explosive **60** is shown in FIG. 1, it is within the scope of the present disclosure that priming assembly **10** may include a plurality of explosives **60**, with each explosive **60** being coupled to a corresponding transmission line **40**.

[0017] In use, a signal is sent to detonate or trigger both detonators **20**. If both detonators **20** detonate substantially simultaneously (i.e., within 0.000001 seconds of one another), explosive charges from both detonators **20** may pass simultaneously to the plurality of transmission lines **40** in housing **100**. Even if one detonator **20** should fail, the explosive charge from the functioning detonator **20** may still pass simultaneously to the plurality of transmission lines **40** in housing **100**. For example, if the detonators **20** do not detonate substantially simultaneously (i.e., within 0.000001 seconds of one another), the first detonator will consume the second detonator, but the explosive charge from the first, functioning detonator may still pass to the plurality of transmission lines **40** in housing **100**. The explosive charge from one or both detonators **20** is conveyed or transmitted along transmission lines **40** to explosives **60**, which may be located at a remote blasting site, causing explosives **60** to detonate. In this embodiment, housing **100** may enable multiple transmission lines **40**, and in turn multiple explosives **60**, to detonate substantially simultaneously (e.g., within microseconds of one another), even when one detonator **20** may fail. Advantageously, housing **100** may accomplish this task reliably, safely, under potentially adverse weather conditions, non-electrically, and/or inexpensively.

[0018] If priming assembly **10** were to include a single detonator **20**, instead of the plurality of detonators **20** of FIG. 1, a dangerous condition may result if that single detonator **20** failed. For example, a user would need to use extreme care and caution when handling the failed detonator **20** to avoid an unwanted detonation of detonator **20** and/or explosive **60**. On the other hand, by providing priming assembly **10** with a plurality of detonators **20**, the likelihood that at least one of the plurality of detonators **20** will function properly increases.

[0019] The illustrative embodiment priming assembly **10** includes two (2) detonators **20a**, **20b**, although the number of detonators **20** may vary. For example, it is within the scope of the present disclosure that priming assembly **10** may include three (3), four (4), or more detonators **20**.

[0020] Detonators **20a**, **20b**, may also be referred to as “blasting caps.” As shown in FIG. 2, each detonator **20a**, **20b**, includes a corresponding signal line **22a**, **22b**, and casing **24a**, **24b**. Casing **24a**, **24b**, of each detonator **20a**, **20b**, contains a relatively sensitive, primary explosive material (not shown), which is less stable, and therefore easier to ignite, than the secondary explosive material (not shown) contained in explosives **60**. Because detonators **20a**, **20b**, may easily ignite, detonators **20a**, **20b**, should be stored apart from explosives **60**.

[0021] The types of detonators **20a**, **20b**, used with priming assembly **10** may vary. Suitable detonators **20a**, **20b**, include, for example, non-electric caps, electric caps which are triggered by an electric current, and fuse caps which are triggered with a match or another heat source. An illustrative detonator **20** is the MK 17 Electric Blasting Cap which is triggered by an electric current.

[0022] The primary explosive material contained in detonators **20a**, **20b**, may also vary. Suitable primary explosive materials for use in detonators **20a**, **20b**, include, for example, pentaerythritol tetranitrate (PETN), cyclotrimethylenetrinitramine (RDX), mercury fulminate, lead azide, lead styphnate, tetryl, and diazodinitrophenol (DDNP).

[0023] Additionally, the illustrative embodiment priming assembly **10** includes ten (10) nonelectric transmission lines **40a-40j**, although the number of transmission lines **40** may vary. For example, it is within the scope of the present disclosure that priming assembly **10** may include two (2), three (3), four (4), five (5), six (6), seven (7), eight (8), nine (9), eleven (11), twelve (12), thirteen (13), fourteen (14), or more transmission lines **40**. In certain embodiments, the number of transmission lines **40** may vary based on the number of explosives **60** provided.

[0024] Transmission lines **40a-40j** may be provided in the form of “detonating cords” or “detcords,” for example, that are produced in accordance with the cut-off characteristics of PER14000035C, paragraph 3.5.1.1.2. Transmission lines **40a-40j** may also be provided in the form of “shocktubes.” Each transmission line **40a-40j** may include a flexible, hollow tube that contains a secondary explosive material (not shown). The secondary explosive material in each transmission line **40a-40j** may convey or transmit the explosive charges from one or both detonators **20a**, **20b**, to explosives **60**, allowing transmission lines **40a-40j** to act as high-speed fuses.

[0025] The type and quantity of the secondary explosive material contained in transmission lines **40a-40j** may vary. In the case of “detonating cords,” a suitable secondary explosive material for use in transmission lines **40a-40j** includes, for example, pentaerythritol tetranitrate (PETN). In the case of “shocktubes,” a suitable secondary explosive material for use in transmission lines **40a-40j** includes, for example, a mixture of cyclotetramethylene-tetranitramine (HMX) and aluminum. Also, suitable transmission lines **40a-40j** may contain 5 grains of explosive per foot, for example, although it is also within the scope of the present disclosure that transmission lines **40a-40j** may contain 0.1 grains of explosive per foot, 2.5 grains of explosive per foot, 7.5 grains of explosive per foot, 10 grains of explosive per foot, or 50 grains of explosive per foot, for example.

[0026] The speed at which an explosive charge travels through each transmission line **40a-40j** may be substantially consistent. For example, in the case of “detonating cords,” the explosive charge may consistently travel through each transmission line **40a-40j** at a speed between about 6,000 m/s and 6,800 m/s, and in the case of “shocktubes,” the explosive charge may consistently travel through each transmission line **40a-40j** at a speed of about 2,000 m/s. By providing transmission lines **40a-40j** of different lengths, a user may detonate multiple explosives **60** at different, yet controlled, times. For example, the user may detonate multiple explosives **60** in a specific order to control the collapse of a building. By providing transmission lines **40a-40j** of the same length, on the other hand, the user may detonate multiple explosives **60** substantially simultaneously. Alternatively, a user may control the timing of detonating multiple explosives **60** using suitable delay detonators.

[0027] As shown in FIG. 2, each transmission line **40a-40j** includes a corresponding, optional seal **42a-42j** coupled to one end (i.e., the end closest to housing **100**) and a corresponding cartridge **44a-44j** coupled to the other end (i.e., the end closest to explosives **60**). In certain embodiments, such as when transmission lines **40a-40j** are provided in the form of “detonating cords,” cartridges **44a-44j** may be provided in the form of booster cartridges that contain a secondary explosive

material (e.g., pentaerythritol tetranitrate (PETN)). In other embodiments, such as when transmission lines 40a-40j are provided in the form of "shocktubes," cartridges 44a-44j may be provided in the form of nonelectric detonator cartridges that contain both a primary explosive material and a secondary explosive material. Each booster cartridge 44a-44j may act as a bridge between its corresponding transmission line 40a-40j and explosive 60. As an alternative to seals 42a-42j, it is also within the scope of the present disclosure that, on the end closest to housing 100, each transmission line 40a-40j may include a second cartridge similar to cartridges 44a-44j to act as a bridge between detonators 20a, 20b, and its corresponding transmission line 40a-40j.

[0028] The illustrative embodiment priming assembly 10 further includes one or more explosives 60. In certain embodiments, each transmission line 40 is coupled to its own individual explosive 60. For example, because the illustrative embodiment priming assembly 10 of FIG. 1 has ten (10) transmission lines 40a-40j, ten (10) explosives 60 may be provided, with each transmission line 40a-40j being coupled to its own individual explosive 60 (although only a single explosive 60 is shown in FIG. 1). In other embodiments, more than one transmission lines 40a-40j may be coupled to a single explosive 60.

[0029] In use, explosives 60 may be placed at a blasting site. For example, explosives 60 may be placed at the site of an excavation operation, a drilling operation, a demolition operation, a military operation, or another suitable operation. Transmission lines 40a-40j span between detonators 20a, 20b, and explosives 60, allowing the user to safely trigger detonators 20a, 20b, at a location remote from the blasting site.

[0030] As discussed above, each explosive 60 may contain a relatively stable, secondary explosive material (not shown). The secondary explosive material contained in explosives 60 may vary. Suitable secondary explosive materials for use in explosives 60 include, for example, cyclotrimethylenetrinitramine (RDX), cyclotetramethylene-tetranitramine (HMX), and trinitrotoluene (TNT).

[0031] Referring next to FIGS. 2-4, the illustrative housing 100 of priming assembly 10 is a multi-piece construct having first portion 102 that receives the plurality of detonators 20 and second portion 104 that receives the plurality of transmission lines 40. However, it is also within the scope of the present disclosure that housing 100 may be a one-piece, unitary construct.

[0032] First portion 102 of housing 100 includes outer wall 103 and second portion 104 of housing 100 includes outer wall 105. When assembled, as shown in FIG. 4, outer walls 103, 105, of first and second portions 102, 104, cooperate to define interior 101 of housing 100 that is at least partially hollow. Housing 100 extends along longitudinal axis 106 from input end 108 to output end 110.

[0033] As shown in FIG. 4, first portion 102 of housing 100 defines recess 112 and second portion 104 of housing 100 includes rim 114 that is sized for receipt within recess 112. In certain embodiments, first and second portions 102, 104, of housing 100 may be coupled together with a suitable adhesive 116, as shown in FIG. 4. In other embodiments, first and second portions 102, 104, of housing 100 may be coupled together with a mechanical fastener, such as a screw (not shown) or a latch (not shown), for example.

[0034] Housing 100 of priming assembly 10 may be constructed of a consumable material, such as plastic or rubber,

or another suitable material. For example, depending on the amount of fragmentation produced, housing 100 may be constructed of an acrylonitrile butadiene styrene (ABS) thermoplastic, Santoprene™ thermoplastic vulcanised (TPV) rubber, or another suitable material having a hardness of about 80 Durometer. Illustrative methods of manufacturing housing 100 include, for example, injection molding.

[0035] First portion 102 of housing 100 defines a plurality of channels or receptacles 120 for receiving and supporting the plurality of detonators 20 therein. In the illustrated embodiment of FIG. 4, for example, first portion 102 of housing 100 defines two (2) receptacles 120a, 120b, for receiving and supporting detonators 20a, 20b, respectively. However, it is within the scope of the present disclosure that first portion 102 of housing 100 may define more than two (2) receptacles 120 for receiving more than two (2) detonators 20.

[0036] As shown in FIG. 4, receptacles 120a, 120b, extend entirely through first portion 102 of housing 100 in a direction substantially parallel to one another and to longitudinal axis 106. In other words, receptacles 120a, 120b, extend from input ports 122a, 122b, in input end 108 of housing 100 (FIG. 2) toward second portion 104 of housing 100 (FIG. 3). In this way, detonators 20a, 20b, may be inserted into input ports 122a, 122b, in input end 108 of housing 100, through receptacles 120a, 120b, in housing 100, and toward second portion 104 of housing 100.

[0037] To enable housing 100 to hold detonators 20 of various shapes and sizes, each receptacle 120a, 120b, of housing 100 may include an array of radially inwardly extending, flexible fins 124a, 124b. When smaller diameter detonators 20a, 20b, are inserted into housing 100, fins 124a, 124b, may extend radially into each receptacle 120a, 120b, to grab and hold the respective detonator 20a, 20b. On the other hand, when larger diameter detonators 20a, 20b, are inserted into housing 100, fins 124a, 124b, may flex to increase the effective internal diameter of each receptacle 120a, 120b, thereby making room for the insertion of each detonator 20a, 20b, without causing an undue increase in the amount of force applied to each detonator 20a, 20b. In certain embodiments, fins 124a, 124b, of each receptacle 120a, 120b, may be configured to grab and hold detonators having diameters between at least 0.210 inches and 0.300 inches. To enable flexion of fins 124a, 124b, relative to housing 100, fins 124a, 124b, may be constructed of a material that is more flexible than housing 100. For example, fins 124a, 124b, may be constructed of thermoplastic vulcanised (TPV) rubber having a hardness of about 60 Durometer. It is also within the scope of the present disclosure that receptacles 120a, 120b, of housing 100 may include threaded inserts and priming adapters (not shown) to receive and hold detonators 20a, 20b.

[0038] Second portion 104 of housing 100 defines a plurality of channels or receptacles 140 for receiving and supporting the plurality of transmission lines 40 therein and for positioning transmission lines 40 relative to detonators 20. In the illustrated embodiment of FIG. 4, for example, second portion 104 of housing 100 defines ten (10) receptacles 140a-140j for receiving and supporting transmission lines 40a-40j, respectively. However, it is within the scope of the present disclosure that second portion 104 of housing 100 may define fewer than ten (10) receptacles 140 for receiving fewer than ten (10) transmission lines 40, or that second portion 104 of housing 100 may define more than ten (10) receptacles 140 for receiving more than ten (10) transmission lines 40.

[0039] As shown in FIG. 4, receptacles 140a-140j extend entirely through second portion 104 of housing 100 in a direction substantially parallel to one another and to longitudinal axis 106. In other words, receptacles 140a-140j extend from first portion 102 of housing 100 (FIG. 2) toward output ports 142a-142j in output end 110 of housing 100 (FIG. 3). In certain embodiments, and as shown in FIG. 4, seals 42a-42j of transmission lines 40a-40j may be sized larger than receptacles 140a-140j to prevent transmission lines 40a-40j from withdrawing from housing 100 through output ports 142a-142j in output end 110 of housing 100.

[0040] According to an exemplary embodiment of the present disclosure, receptacles 140a-140j in second portion 104 of housing 100 may be semi-circular and partially open (FIG. 6). Receptacles 140a-140j may adequately surround transmission lines 40a-40j to retain transmission lines 40a-40j therein while preventing lateral removal of transmission lines 40a-40j from receptacles 140a-140j. To achieve such retention, receptacles 140a-140j may surround more than 180 degrees of each transmission line 40a-40j. On the other hand, receptacles 140a-140j may be at least partially open, leaving transmission lines 40a-40j exposed to the explosive charge from detonators 20a, 20b. To achieve such exposure, receptacles 140a-140j may surround less than 360 degrees of each transmission line 40a-40j. For example, exemplary receptacles 140a-140j may surround about 190 degrees, 200 degrees, or 210 degrees of each transmission line 40a-40j. Receptacles 120a, 120b, in first portion 102 of housing 100, on the other hand, may be circular to fully surround or encircle each detonator 20a, 20b (FIG. 5).

[0041] When priming assembly 10 is assembled, transmission lines 40a-40j may surround detonators 20a, 20b, as shown in FIG. 5, which is a cross-section taken in a direction perpendicular to longitudinal axis 106. In other words, detonators 20a, 20b, may extend centrally through housing 100 near longitudinal axis 106, and transmission lines 40a-40j may be located radially outwardly from detonators 20a, 20b, and longitudinal axis 106.

[0042] Additionally, when priming assembly 10 is assembled, detonators 20a, 20b, and transmission lines 40a-40j may longitudinally overlap in a direction perpendicular to longitudinal axis 106, as shown in FIG. 4. For example, detonators 20a, 20b, may extend beyond the interfacing plane P between first and second portions 102, 104, of housing 100 (i.e., the interfacing plane P that contains adhesive layer 116) and into second portion 104 of housing 100 along with transmission lines 40a-40j. Similarly, seals 42a-42j may longitudinally overlap detonators 20a, 20b, in the direction perpendicular to longitudinal axis 106, as shown in FIG. 4. For example, seals 42a-42j may extend beyond interfacing plane P and into first portion 102 of housing 100 along with detonators 20a, 20b.

[0043] To ensure that the explosive charge from the detonators 20a, 20b, is effectively conveyed or transmitted to transmission lines 40a-40j, housing 100 may include or be packed with a booster material 150, such as DETAPRIME, which is a flexible material that includes pentaerythritol tetranitrate (PETN). Booster material 150 may amplify or “boost” the energy released by detonators 20a, 20b, to ensure that sufficient energy is delivered to detonate transmission lines 40a-40j and, in turn, to detonate cartridges 44a-44j and explosives 60. The quantity of booster material 150 provided in housing 100 and the distance, if any, separating booster material 150 from detonators 20a, 20b, and/or transmission

lines 40a-40j may vary to achieve an effective communication of the explosive charge from detonators 20a, 20b, to transmission lines 40a-40j.

[0044] Booster material 150 may surround receptacles 120a, 120b, in first portion 102 of housing 100 and/or may extend between receptacles 140a-140j in second portion 104 of housing 100. In the illustrated embodiment of FIGS. 2 and 4, for example, booster material 150 includes two (2), hollow tubes 150a, 150b, located between receptacles 140a-140j in second portion 104 of housing 100, each booster tube 150a, 150b, configured to receive a corresponding detonator 20a, 20b, therein. Because transmission lines 40a-40j may be surrounded by receptacles 140a-140j on one side (i.e., the side closest to outer wall 105) and exposed on the other side (i.e., the side closest to the hollow interior 101 of housing 100), transmission lines 40a-40j may be exposed to booster material 150.

[0045] The manner in which booster material 150 is retained within housing 100 may vary. In certain embodiments, booster material 150 may be retained within housing 100 by way of a friction-fit with detonator 20a, 20b, transmission lines 40a-40j, and/or part of housing 100. In other embodiments, booster material 150 may be retained within housing 100 using a suitable adhesive, for example. In still other embodiments, booster material 150 may be retained within housing 100 by at least partially covering or enclosing output end 110 of housing 100.

[0046] Priming assembly 10 may be at least partially pre-assembled before supplying priming assembly 10 to a user. For example, as shown in FIG. 4, transmission lines 40a-40j may be inserted into receptacles 140a-140j of housing 100 before supplying priming assembly 10 to the user. Also, housing 100 may be packed with booster material 150 before supplying priming assembly 10 to the user. After inserting transmission lines 40a-40j and/or booster material 150 into housing 100, first and second portions 102, 104, of housing 100 may be coupled together, such as with a suitable adhesive 116, to close housing 100. In this way, the user may only need to insert detonators 20a, 20b, into housing 100 and couple transmission lines 40a-40j to explosives 60, as shown in FIG. 1. It is also within the scope of the present disclosure that booster material 150 may be inserted into housing 100 along with or after detonators 20a, 20b.

[0047] While this invention has been described as having preferred designs, the present invention can be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.

1-18. (canceled)

19. A method for coupling a first detonator and a second detonator to at least one explosive, the method comprising the steps of:

providing a housing that includes a first detonator receptacle, a second detonator receptacle, and a plurality of transmission line receptacles, the plurality of transmission line receptacles receiving a plurality of transmission lines;

inserting the first detonator into the first detonator receptacle of the housing to communicate with the plurality of transmission lines;

inserting the second detonator into the second detonator receptacle of the housing to communicate with the plurality of transmission lines; and
coupling the plurality of transmission lines to the at least one explosive.

20. The method of claim **19**, further comprising the step of triggering the first and second detonators to generate an explosive charge from at least one of the first and second detonators, the plurality of transmission lines simultaneously receiving the explosive charge.

21. The method of claim **19**, further comprising the step of triggering the first and second detonators to generate an explosive charge from at least one of the first and second detonators, the plurality of transmission lines conveying the explosive charge to the at least one explosive to detonate the at least one explosive.

22. The method of claim **19**, wherein the inserting steps comprise inserting the first and second detonators into the housing radially inwardly of the plurality of transmission lines.

23. The method of claim **19**, further comprising the step of gripping the first and second detonators in the first and second detonator receptacles, respectively, with flexible fins that extend radially into the first and second detonator receptacles.

24. The method of claim **19**, wherein the first and second detonators contain a more sensitive, primary explosive material and the at least one explosive contains a more stable, secondary explosive material, and wherein the coupling step comprises coupling the primary explosive material of the first and second detonators to the secondary explosive material of the at least one explosive.

25. The method of claim **19**, further comprising the steps of:

inserting the plurality of transmission lines into the plurality of transmission line receptacles; and
closing the housing to capture the plurality of transmission lines within the housing.

26. A method for manufacturing a priming assembly for coupling a plurality of detonators to at least one explosive through a plurality of transmission lines, the method comprising the steps of:

forming a housing that includes an outer wall defining an interior of the housing, a plurality of detonator receptacles in the interior of the housing, and a plurality of transmission line receptacles in the interior of the housing, the plurality of detonator receptacles being sized to receive the plurality of detonators and the plurality of transmission line receptacles being sized to receive the plurality of transmission lines, at least one of the plurality of transmission line receptacles communicating with the plurality of detonator receptacles within the housing; and

inserting the plurality of transmission lines into the plurality of transmission line receptacles in the housing, at least one of the plurality of transmission lines communicating with the plurality of detonator receptacles within the housing.

27. The method of claim **26**, wherein the forming step comprises injection molding at least one of a plastic material and a rubber material.

28. The method of claim **26**, wherein the forming step comprises forming at least a first portion of the housing and a second portion of the housing distinct from the first portion of the housing, the first portion of the housing defining the plurality of detonator receptacles and the second portion of the housing defining the plurality of transmission line receptacles.

29. The method of claim **28**, further comprising the step of coupling the first portion of the housing to the second portion of the housing after the inserting step to capture the plurality of transmission lines within the housing.

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